
7.2

REPLACEMENT PROCEDURES

This section contains precautions, required tools and materials, and step-by-step procedures for replacing parts in the infusion system. Before opening the infusion system enclosures, take all necessary precautions for working on high-voltage equipment.

WARNING

UNLESS OTHERWISE INDICATED, DISCONNECT THE INFUSION SYSTEM FROM AC (MAINS) POWER BEFORE PERFORMING ANY REPLACEMENT PROCEDURE.

CAUTION: Use proper ESD grounding techniques when handling components. Wear and antistatic wrist strap and use an ESD-protected workstation. Store the PWA in an antistatic bag before placing it on any surface.

CAUTION: Any repair or replacement must be followed by the appropriate PVT described in *Section 5.2, Performance Verification Test (1.5 Series)*, or *Section 5.3, Performance Verification Test (1.6 Series)*.

7.2.1

REQUIRED TOOLS AND MATERIALS

Standard handtools, special tools, and materials required for the repair and replacement procedures in this section are described in *Section 7.2.1.1, Standard Handtools*, and *Section 7.2.1.2, Materials*. Tools and materials required for specific repair and replacement are listed at the beginning of each procedure.

7.2.1.1

STANDARD HANDTOOLS

The following standard handtools, or equivalents, are required for the repair and replacement procedures presented in this section:

- ☐ No. 1 Phillips screwdriver
- ☐ No. 2 Phillips screwdriver
- ☐ Small size flat-blade screwdriver
- ☐ Medium size flat-blade screwdriver
- ☐ X-acto® knife, with round No. 10 and pointed No. 11 blades
- ☐ Wire cutter
- ☐ Wire stripper
- ☐ Electricians knife
- ☐ Set of Allen wrenches
- ☐ Nutdriver set
- ☐ Long needle-nose pliers
- ☐ 1/4 inch right angle socket wrench
- ☐ External retaining ring pliers
- ☐ Grease extension

- ☐ Digital multimeter (DMM), Fluke model 77
- ☐ PlumSet® List No. 6426
- ☐ Large bore needle (18 gauge)
- ☐ 20 cc syringe
- ☐ Digital pressure meter (DPM), 0 to 50 psig, Bio-Tek DPM II
- ☐ Three-way stopcock, List 3233

7.2.1.2

MATERIALS

The materials required for repair and replacement procedures include the following:

- ☐ Grease, Braycote® 804, P/N 743-38212-001
- ☐ Lint-free cloth or cotton swabs
- ☐ Red GLPT insulating varnish
- ☐ Electro-Wash® 2000 or isopropyl alcohol
- ☐ Small six-inch brush

7.2.1.3

ACCESSORIES

The accessories required for repair of optional features on 1.6 series infusion systems are listed in *Table 7-1, Accessories for 1.6 Series Infusion Systems*. Refer to *Figure 7-13, DataPort Accessory Cable Schematics*, for cable schematics.

Table 7-1. Accessories for 1.6 Series Infusion Systems	
Part Description	List/Part Number
DataPort cable assembly, infusion system to PC. 8-foot, male DB-15 to female DB-9 connector	11431-01
DataPort cable assembly, infusion system to PC. 8-foot, male DB-15 to female DB-25 connector	11431-02
DataPort cable assembly, junction box to PC. 8-foot, 6-pin modular connector to female DB-9 connector	11431-03
DataPort cable assembly, junction box to PC. 8-foot, 6-pin modular connector to female DB-25 connector	11431-04
DataPort cable assembly, junction box to junction box. 2-foot, 6-pin modular connector to 6-pin modular connector	11431-06
DataPort cable assembly, junction box to junction box. 4-foot, 6-pin modular connector to 6-pin modular connector	11431-07
DataPort cable assembly, junction box to junction box. 8-foot, 6-pin modular connector to 6-pin modular connector	11431-08

Table 7-1. Accessories for 1.6 Series Infusion Systems	
Part Description	List Number
Flow detector	1907-25
Junction Box assembly	11429
Part Description	Part Number
<i>LifeCare 5000 Concurrent Flow Infusion System With DataPort Programmer's Guide</i>	430-03681-001

7.2.2

BATTERY PACK REPLACEMENT

The recommended tool for this procedure is a No. 2 Phillips screwdriver.

Note: Before replacing the battery pack, check the fuse and battery charger circuits for proper operation.

To replace the battery pack, refer to *Figure 7-1, Battery Pack Replacement*, then proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Place the infusion system on its side on a soft surface.
3. Using a No. 2 Phillips screwdriver, remove the three screws securing the battery pack cover to the bottom of the infusion system.
4. Slide the battery pack cover towards the rear of the infusion system to disengage the cover tabs. Remove the battery pack cover.
5. Remove the battery pack.
6. Disconnect the female connector from the male connector. Connect the female connector of the replacement battery pack to the male connector.

Note: The connectors are keyed to eliminate misconnections.

7. Insert the replacement battery pack into its compartment and position until seated properly.

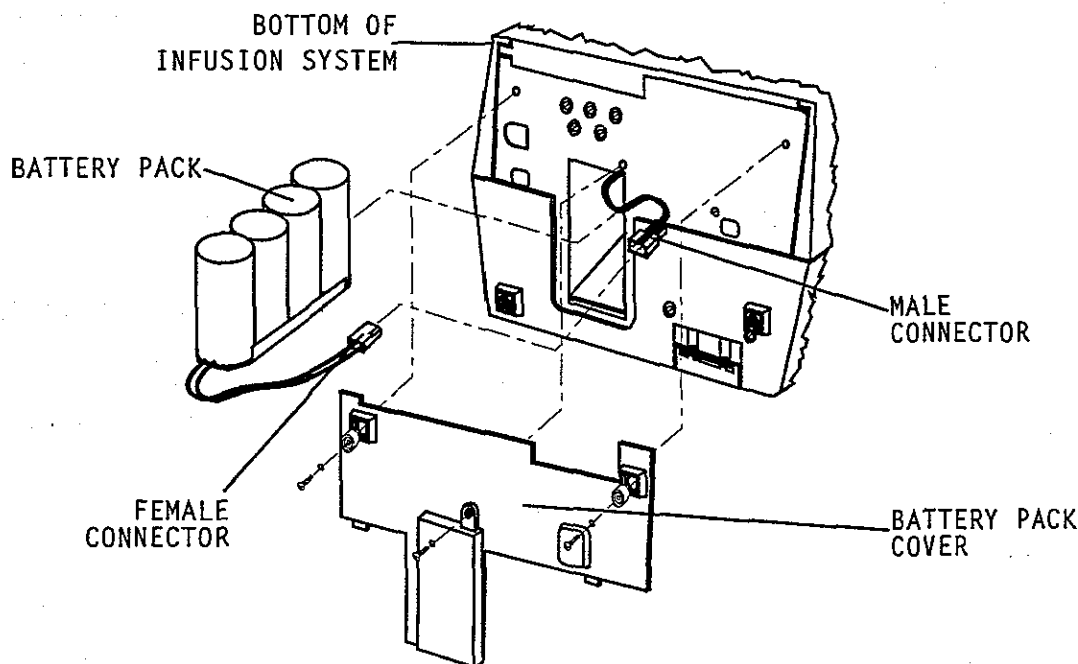
Note: Verify the battery pack top is positioned toward the infusion system center and the battery pack cable end is positioned toward the infusion system outside (base), as shown in *Figure 7-1, Battery Pack Replacement*.

8. Place the cable and connector into the battery compartment on top of the battery pack, taking care not to kink the cable.
9. Using a No. 2 Phillips screwdriver, replace the three screws securing the battery pack cover to the infusion system.
10. Insert a cassette in the infusion system.

11. Close the cassette door. Verify that the red battery symbol illuminates and the infusion system self test successfully completes.
12. To assure that the battery pack is charged, connect the infusion system to AC (mains) power for 24 hours.

Note: Battery pack recharges to 80 percent of the prior charge in 16 hours, while operating at a delivery rate of 125 mL/hr or lower.

To verify successful replacement of the battery pack, perform the PVT as described in Section 5.2 (1.5 series) or Section 5.3 (1.6 series).



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Figure 7-1. Battery Pack Replacement

7.2.3

AC (MAINS) POWER CORD (UL QUALIFIED) REPLACEMENT

This procedure requires a No. 2 Phillips screwdriver.

Note: Replacement of the AC (mains) power cord involves removal of the retaining plate on the rear of the infusion system. If the retaining plate is damaged, replace it.

To replace the AC (mains) power cord, refer to *Figure 7-2, Fuses, AC (Mains) Power Cord, Velcro Strap, and Retaining Plate Replacement*, then proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Using a No. 2 Phillips screwdriver, remove the four screws securing the AC (mains) power cord retaining plate to the rear housing. Remove the retaining plate.
3. Grasp the cord plug and remove it from the infusion system AC (mains) power receptacle.

Note: Do not disconnect power cord by pulling on power cable.

4. Connect the replacement AC (mains) power cord to the infusion system AC (mains) power receptacle.

Note: The plug is keyed to eliminate misconnections.

5. Using a No. 2 Phillips screwdriver, replace the four screws securing the retaining plate to the rear housing.

To verify successful replacement of the AC (mains) power cord, perform the PVT as described in Section 5.2 (1.5 series) or Section 5.3 (1.6 series).

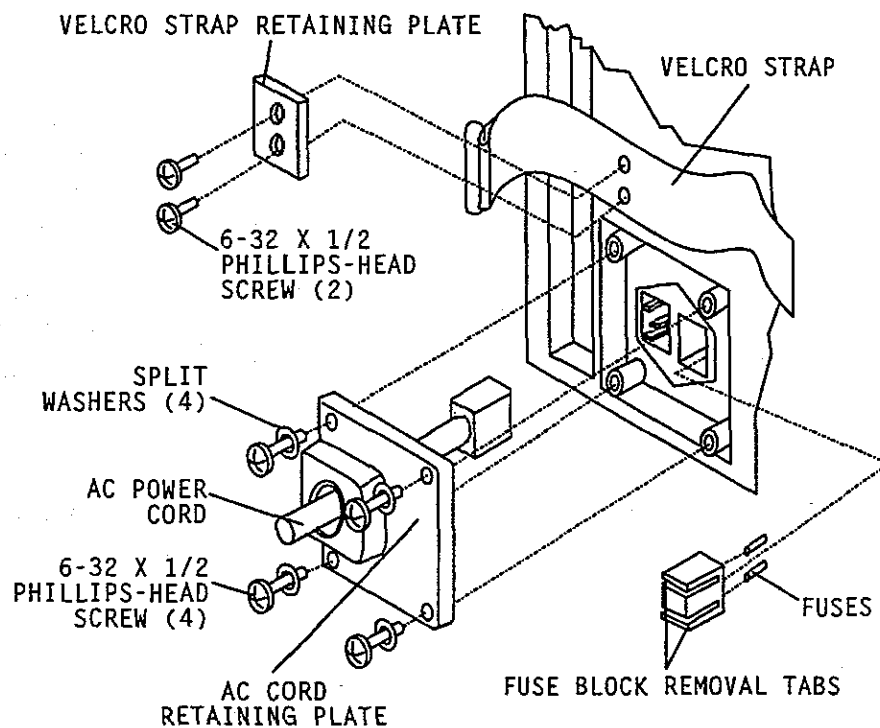


Figure 7-2. Fuses, AC (Mains) Power Cord, Velcro Strap, and Retaining Plate Replacement

7.2.3.1

AC (MAINS) POWER CORD (IEC QUALIFIED) REPLACEMENT

No tools are recommended for this procedure.

To replace the AC (mains) power cord, disconnect the power cord from the rear of the infusion system and connect the new power cord.

Replacement of the IEC qualified AC (mains) power cord is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in Section 5.2 (1.5 series) or Section 5.3 (1.6 series).

7.2.4

AC (MAINS) POWER CORD PLUG REPLACEMENT

The recommended tools for this procedure are as follows: wire stripper, wire cutter, medium flat-blade screwdriver, and electricians knife.

Note: The following procedure is only a general guide, not a specific method for AC (mains) power cord plug replacement. The AC (mains) power cord plug can be replaced by a hospital-grade replacement plug. The exact procedure depends upon the replacement AC (mains) power cord plug.

To replace the AC (mains) power cord plug, proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Using a wire cutter, remove the plug from the AC (mains) power cord.
3. Using a medium flat-blade screwdriver, disassemble the replacement plug to access the plug terminals and to estimate the amount of insulation needed to be removed from the AC (mains) power cord.
4. Using an electricians knife, remove sufficient outer insulation from the power cord end to expose three individual wires.
5. Using a wire stripper, remove approximately 1/4 inch (0.63 cm) of insulation from the three wires to permit connection of bare conductors to the replacement plug.
6. Connect each wire to the replacement plug. Connect the ground (earth) wire to the plug ground lug.
7. Re-assemble the replacement plug.

To verify successful replacement of the AC (mains) power cord plug, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.5

FUSE AND FUSE DRAWER REPLACEMENT

The recommended tools for this procedure are as follows: No. 2 Phillips screwdriver and small flat-blade screwdriver.

To replace the fuses or fuse drawer, refer to *Figure 7-2, Fuses, AC (Mains) Power Cord, Velcro Strap, and Retaining Plate Replacement*, then proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Using a No. 2 Phillips screwdriver, remove the AC (mains) power cord retaining plate to access the fuse drawer.
3. Using a small flat-blade screwdriver, wedge the screwdriver tip between each removal tab and the side of the fuse drawer compartment to loosen the fuse drawer.
4. Compress the removal tabs until the fuse drawer unlatches. Slide the fuse drawer from the compartment.
5. Remove the fuses from the fuse drawer. Replace the fuse drawer if defective. Replace the fuses.
6. Insert the fuse drawer into the compartment. Push the fuse drawer until it clicks securely in place.

7. Replace the AC (mains) power cord and retaining plate.
8. Connect the infusion system to a hospital grade AC (mains) outlet and verify that the AC (mains) symbol illuminates.

To verify successful replacement of the fuses or fuse drawer, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.6

VELCRO STRAP AND RETAINING PLATE REPLACEMENT

The recommended tools for this procedure are as follows: No. 2 Phillips screwdriver and X-acto knife with pointed No. 11 blade.

To replace the Velcro strap and the retaining plate, refer to *Figure 7-2, Fuses, AC (Mains) Power Cord, Velcro Strap, and Retaining Plate Replacement*, then proceed as follows:

1. Remove the two screws that attach the Velcro strap and retaining plate to the rear of the infusion system. Remove the retaining plate and strap. Do not discard the strap.

Note: The replacement Velcro strap does not have holes for mounting screws. The holes must be punched at the time of installation.

2. Set the replacement Velcro strap on the work surface with the fuzzy side down. Place the retaining plate on the strap in the exact location as on the old strap, using the old strap as a template. Mark hole locations on the replacement strap.
3. Using an X-acto knife, punch holes in the replacement strap at the marked locations.
4. Replace the retaining plate if damaged.
5. Install the replacement strap and retaining plate using the two screws removed in Step 1.

Replacement of the Velcro strap is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.7

POLE CLAMP COMPONENT REPLACEMENT

The recommended tools for this procedure are as follows: 5/64 inch and 7/64 inch Allen wrenches, No. 1 Phillips screwdriver, external retaining ring pliers, and grease.

To replace the pole clamp knob, pole clamp shaft and screw, and pole clamp friction plate, proceed as follows:

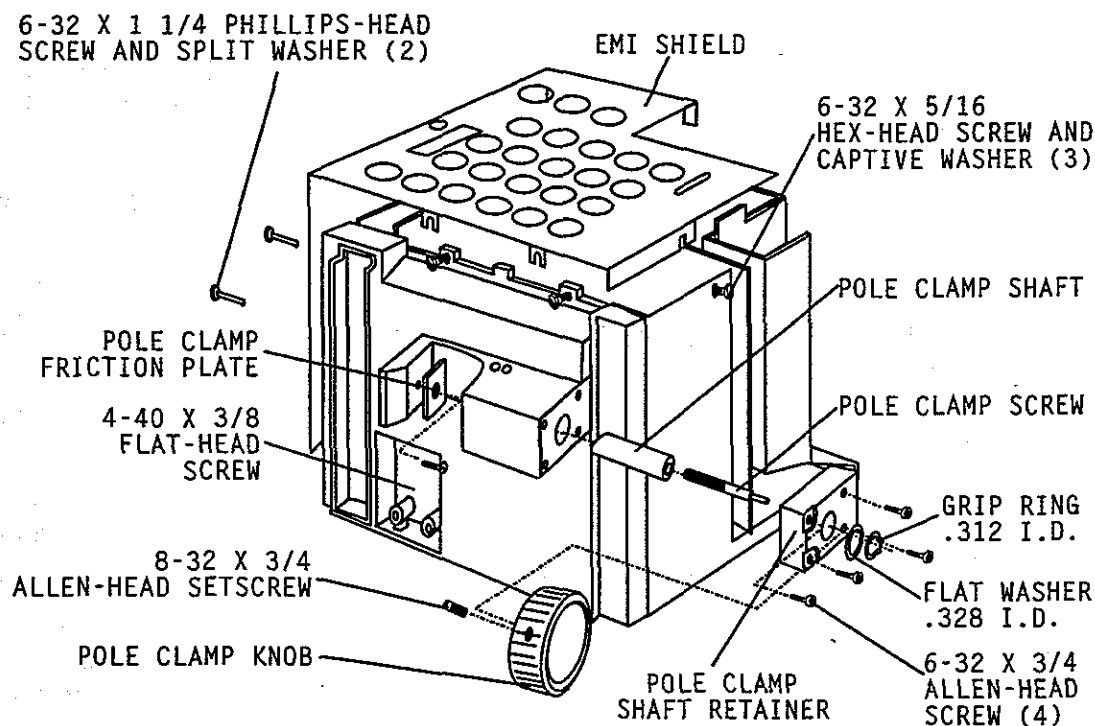
7.2.7.1

POLE CLAMP KNOB REPLACEMENT

To replace the pole clamp knob, refer to *Figure 7-3, Pole Clamp and EMI Shield Replacement*, then proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Using a 5/64 inch Allen wrench, loosen the setscrew from the pole clamp knob. Separate the pole clamp knob from the pole clamp screw by pulling on the pole clamp knob.
3. Replace the knob. Secure and tighten the setscrew.

Replacement of pole clamp components is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.



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Figure 7-3. Pole Clamp and EMI Shield Replacement

7.2.7.2

POLE CLAMP SHAFT AND POLE CLAMP SCREW REPLACEMENT

To replace the pole clamp shaft and pole clamp screw, refer to *Figure 7-3, Pole Clamp and EMI Shield Replacement*, then proceed as follows:

1. Remove the pole clamp knob as described in *Section 7.2.7.1, Pole Clamp Knob Replacement*.
2. Using the external retaining ring pliers, remove the grip ring and flat washer.

3. Using a 7/64 inch Allen wrench, remove the four screws securing the pole clamp shaft retainer to the rear case. Set the pole clamp shaft retainer aside for re-assembly.
4. Remove the pole clamp shaft. Rotate the shaft counterclockwise to separate it from the pole clamp screw.
5. Replace the pole clamp screw in the shaft; lubricate with grease if necessary.
6. Reinsert the pole clamp shaft and screw in the rear case. Verify the shaft bevel is positioned toward the inside of the casing.
7. Using a 7/64 inch Allen wrench, replace the four screws securing the pole clamp shaft retainer to the rear case. Re-assemble the grip ring and washer; replace if necessary.
8. Clamp the infusion system to an IV pole. Verify the infusion system does not slide on the pole.

Replacement of pole clamp components is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.7.3

POLE CLAMP FRICTION PLATE REPLACEMENT

To replace the pole clamp friction plate, refer to *Figure 7-3, Pole Clamp and EMI Shield Replacement*, then proceed as follows:

1. Remove the pole clamp knob as described in *Section 7.2.7.1, Pole Clamp Knob Replacement*, and the shaft and screw as described in *Section 7.2.7.2, Pole Clamp Shaft and Pole Clamp Screw Replacement*.
2. Using a No. 2 Phillips screwdriver, remove the screw securing the friction plate to the rear case. Set the screw aside for re-assembly.
3. Replace the friction plate. Using a No. 2 Phillips screwdriver, replace the screw securing the friction plate to the rear case.
4. Re-assemble the pole clamp components in exact reverse order of disassembly.
5. Clamp the infusion system to an IV pole. Verify the infusion system does not slide on the pole.

Replacement of pole clamp components is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.8

DIP SWITCH COVER REPLACEMENT

The recommended tool for this procedure is a small flat-blade screwdriver.

Note: The DIP switch cover is located in the recessed I/O port panel on the left rear of the infusion system. In 1.6 series infusion systems with DataPort accessory cables, the DIP switch cover is located below the DataPort accessory cable connector; in other models, the DIP switch cover is located at the top of the I/O port panel.

To replace the DIP switch cover, proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Using a small flat-blade screwdriver, remove the screw securing the DIP switch cover to the recessed I/O port panel.
3. Remove and replace the DIP switch cover. Using a small flat-blade screwdriver, replace the screw securing the DIP switch cover to the recessed I/O port panel.

Replacement of the DIP switch cover is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.9

RUBBER FOOT PAD AND FOOT INSERT REPLACEMENT

The recommended tool for this procedure is a No. 2 Phillips screwdriver.

To replace rubber foot pads and foot pad inserts, proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Place the infusion system on its side with the bottom of the infusion system facing the technician.
3. Using a No. 2 Phillips screwdriver, remove the screw securing the rubber foot pad and foot insert on each corner of the infusion system.
4. Position the new rubber foot pad and foot insert.
5. Using a No. 2 Phillips screwdriver, replace the screw securing the rubber foot pad and foot insert.

Replacement of the rubber foot pad and foot insert is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.10

FLOW DETECTOR REPLACEMENT (1.6 SERIES)

No tools are recommended for this procedure.

Note: The flow detector connects to the ACC jack that is located in the recessed I/O port panel on the left rear of the infusion system.

To replace the flow detector, disconnect the detector from the ACC jack and connect the replacement flow detector.

Replacement of the flow detector is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.3*.

7.2.11**NURSE-CALL CABLE REPLACEMENT**

No tools are recommended for this procedure.

Note: The nurse-call cable connects to the NURSE CALL jack in the recessed I/O port panel on the left rear of the infusion system.

To replace the nurse-call cable, proceed as follows:

1. Disconnect the old nurse-call cable from the NURSE CALL connector and connect the new nurse-call cable.
2. Verify that the new cable is operational by performing the nurse-call test in *Section 5.2.5 (1.5 series)* or *Section 5.3.5 (1.6 series)*.

Replacement of the nurse-call cable is a routine maintenance procedure and no additional verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.12**MINIPOLE ASSEMBLY REPLACEMENT**

No tools are recommended for this procedure.

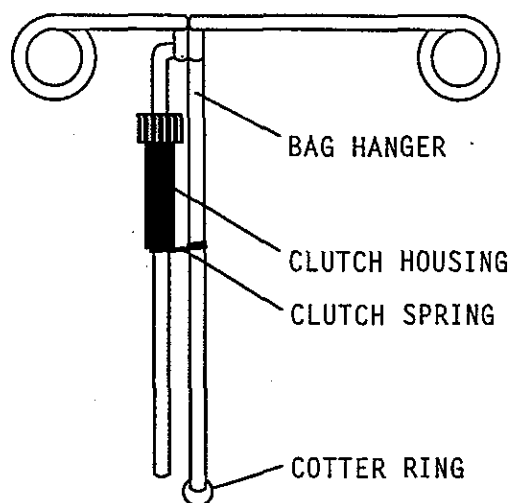
Note: The minipole assembly attaches to the infusion system through two holes in the pole clamp assembly and is held in place on the pole clamp assembly by a cotter ring. This cotter ring passes through a hole near the end of the longer of the two vertical rods on the bag hanger and prevents the removal of the assembly from the holes in the pole clamp.

7.2.12.1**COTTER RING REPLACEMENT**

To replace the cotter ring, refer to *Figure 7-4, Minipole Assembly Replacement*, then proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Place the infusion system face down on a soft surface.
3. Grasp the cotter ring with thumb and finger. Twist, rotate, and remove the cotter ring from rod hole.
4. Replace the cotter ring in exact reverse order of removal.

Replacement of the cotter ring is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.



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Figure 7-4. Minipole Assembly Replacement

7.2.12.2

BAG HANGER REPLACEMENT

To replace the bag hanger, refer to *Figure 7-4, Minipole Assembly Replacement*, then proceed as follows:

1. Remove the cotter ring.
2. Remove the bag hanger from the pole clamp rod holes.
3. Insert the replacement bag hanger in the pole clamp rod holes.
4. Insert the cotter ring.

Replacement of the bag hanger is routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.12.3

CLUTCH HOUSING REPLACEMENT

To replace the clutch housing, refer to *Figure 7-4, Minipole Assembly Replacement*, then proceed as follows:

1. Remove the minipole assembly from the infusion system.
2. Turn the clutch housing knob counterclockwise and remove.
3. Install the replacement clutch housing by turning the clutch housing knob clockwise and sliding it up the short rod. Confirm the clutch spring slides up the long rod.

Replacement of the clutch housing is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.12.4**CLUTCH SPRING REPLACEMENT**

To replace the clutch spring, refer to *Figure 7-4, Minipole Assembly Replacement*, then proceed as follows:

1. Remove the clutch housing as described in *Section 7.2.12.3, Clutch Housing Replacement*.
2. Work clutch spring free from clutch housing hole and replace with a new clutch spring.

Replacement of the clutch spring is a routine maintenance procedure and no verification procedure is normally required. However, if the infusion system may have been damaged during this procedure, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.

7.2.13**SEPARATING THE FRONT AND REAR COVERS**

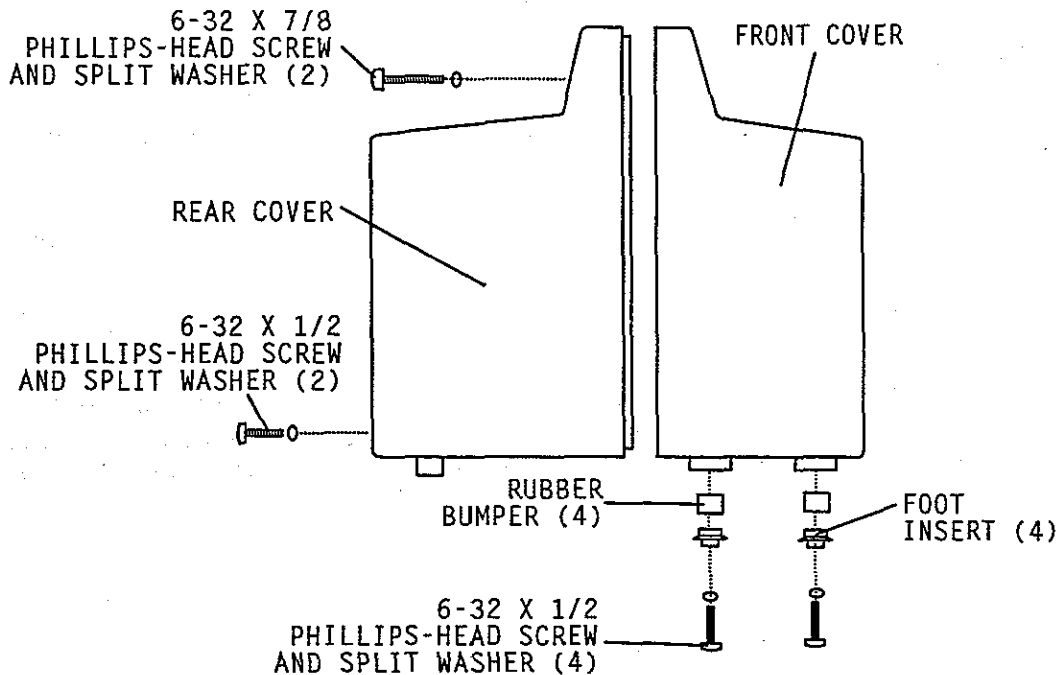
The recommended tools for this procedure are as follows: medium flat-blade screwdriver and No. 2 Phillips screwdriver.

CAUTION: Use proper electrostatic discharge (ESD) grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

To separate the front and rear covers, refer to *Figure 7-5, Front and Rear Cover Replacement*, then proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Remove the battery pack as described in *Section 7.2.2, Battery Pack Replacement*.
3. If attached, remove minipole assembly as described in *Section 7.2.12, Minipole Assembly Replacement*.
4. Using a No. 2 Phillips screwdriver, remove the two screws and washers from the infusion system handle. Remove the two screws from the lower rear of the infusion system cover. Remove the rear cover.
5. Place infusion system face down on a soft surface.
6. Remove the rubber foot pads and foot inserts as described in *Section 7.2.9, Rubber Foot Pad and Foot Insert Replacement*.
7. Using a flat-blade screwdriver, wedge the front cover so that it clears the hex-head screw on the bottom of the infusion system. Remove the front cover.
8. Re-assemble the front and rear covers in the exact reverse order of separation.

To verify successful replacement of the front and rear covers, perform the PVT as described in *Section 5.2 (1.5 series)* or *Section 5.3 (1.6 series)*.



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Figure 7-5. Front and Rear Cover Replacement

7.2.14

EMI SHIELD REPLACEMENT

The recommended tools for this procedure are as follows: medium flat-blade screwdriver, No. 2 Phillips screwdriver, and 1/4 inch nutdriver.

CAUTION: Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected workstation. Store PWA in an antistatic bag before placing it on any surface.

Note: The EMI shield must be removed in order to access the PWAs, the piezoelectric alarm, or the AC (mains) receptacle assembly for replacement as described in Section 7.2.16 through Section 7.2.19 and Section 7.2.24 through Section 7.2.26.

To replace the EMI shield, refer to Figure 7-3, Pole Clamp and EMI Shield Replacement, then proceed as follows:

1. Disconnect the infusion system from AC (mains) power.
2. Separate the front and rear covers as described in Section 7.2.13, *Separating the Front and Rear Covers*.
3. Position the infusion system on its base, with the rear of the infusion system facing the technician.
4. Using a No. 2 Phillips screwdriver, remove the two screws on the left side of the infusion system. Set the two screws aside for re-assembly.
5. Using a 1/4 inch nutdriver, loosen the two screws at the top rear of the infusion system and one screw at the top right of the infusion system. Set the three screws aside for re-assembly.
6. Lift the EMI shield; tilt it up at left to avoid damaging PWAs. Remove the EMI shield.
7. Install the replacement EMI shield.